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Challenges and Solutions from Accident Investigators' Different Professional Backgrounds Related to Data Collection and Interpretation

***Wesley Chan** (ISASI Member)[1] and **Wen-Chin Li**[2]

[1]Hong Kong Air Line Pilots' Association

[2]Safety and Accident Investigation Centre, Cranfield University, United Kingdom

Author Biographies

1 *Wesley Chan is Boeing 777 pilot, Crew Resource Management and Multi-Crew Cooperation Trainer for a major international airline in Hong Kong. He is on the expert panel for the International Federation of Air Line Pilots' Associations (IFALPA) Pilot Profession Working Group and the Hong Kong ALPA Technical and Safety Committee. He holds an MSc in Aviation Human Factors (Coventry University) and is a PhD Candidate at the Cranfield University Safety and Accident Investigation Centre. His research expertise is on the effects of culture, particularly cross-cultural identities, on safety relevant behaviours. Wesley is a member of ISASI.*

E-mail: wesley.chan@cranfield.ac.uk

2 *Dr. Wen-Chin Li is a Senior Lecturer in the Safety and Accident Investigation Centre, Cranfield University, United Kingdom. He is a Fellow and Chartered Ergonomist and Human Factors Specialist of Institute of Ergonomics and Human Factors (CIEHF), and an Aviation Human Factors Specialist of European Association of Aviation Psychology (EAAP). His expertise includes Accident Investigation, Cross-cultural Research, Flight Deck Design, and Aeronautical Decision-making. He has published over 100 books, journal articles and conference proceedings related to Accident Investigations, Human Factors and Aviation Safety.*

E-mail: wenchin.li@cranfield.ac.uk

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1. Introduction

The collection and interpretation of multimedia data can be considered as a routine step in the accident investigation process. Data from FDRs, CVRs, and other sources such as airborne image recorders, datalink downloads, and QARs/DARs, have been widely used for accident investigation (ICAO, 2011). Novel sources of multimedia information have also been gaining in popularity. The proliferation of smartphones, security, and dashboard cameras (see Fig. 1) have resulted in an increase in the number of photos and videos captured of aircraft accidents (Aviation Safety Council, 2016). Techniques have been developed to support the use of these media files, such as through calibration of videos shot by bystanders with onboard CVR audio, to assist in accident investigations (Aviation Safety Council, 2016; Horak, 2019). Unmanned Aerial Vehicles (UAVs), or drones, have also become a popular tool. They are relatively inexpensive to obtain and can be deployed quickly by the investigative teams on arrival to an accident scene. Unlike using helicopters for aerial photography, drones can be flown close to obstacles, and do not have issues such as rotor downwash which may disturb the site (Gomez et al., 2017; Hawkins, 2016). Remote sensing and image filter technology can also assist in the identification of different materials. For example, liquid fuel, aircraft parts, vegetation, etc., can be mapped for wreckage survey and site safety assessments (Gomez et al., 2017; Privett et al., 2012). Digital photogrammetry can be used to create 3D reconstructions of the wreckage, enabling remote collaboration between investigative teams (Hawkins, 2016; Wang, 2022).

Figure 1. Snapshot of the dashboard camera video which was used in the investigation of Flight GE235 to synchronise CVR time, flight path, and aircraft attitude (Aviation Safety Council, 2016).

1.1 Perception and Interpretation Biases Affecting Accident Investigations

In aircraft accident investigations, investigators need to minimise bias by looking for anomalies rather than corroborating evidence (Nixon and Braithwaite, 2018). However, current practices in the collection and interpretation of data may be subject to perceptive biases. Accident investigators come from different professional backgrounds (e.g., manufacturers, regulators, human factors, pilots, engineering, airline safety, etc.). This exposes the data collection process to the relevance paradox, where people tend to only acquire information that they perceive to be relevant to them (Williams, 2010). Although the ICAO's Manual of Aircraft Accident and Incident Investigation (Doc 9756) specifies what to photograph and record at an accident site, the problem remains that access time at an accident site is often limited, and many kinds of evidence are perishable (ICAO, 2011). In these situations, the accident investigators' selection and prioritisation of what data to collect becomes important. Investigators from different professional backgrounds may choose different points to focus on, based on what they consider relevant. Similarly, the product of data collection may be affected by how the multimedia data is captured. When taking aerial photographs for wreckage survey, for example, it is up to the investigator to decide on the breadth of the search area, the required resolution, and to choose relevant focal points (Hawkins, 2016).

Investigators' interpretation of data may also be influenced by the observer effect, which states that the understanding of an observation is dependent on what the observer expects to see (Risinger et al., 2002).

In a previous study in which accident investigators were asked to specifically identify equipment failures, the participants instead listed similar amounts of personnel-related issues (Underwood, Waterson and Braithwaite, 2016). Even when the data is collected automatically, human interpretative differences may potentially affect the outcomes. Whilst flight recorder readouts, flight animations, and datalink downloads provide far more parameters than the minimum required, human factors such as pilot responses and decision-making are not recorded. This makes it difficult for investigators to objectively interpret the operational behaviours of the flight crew (Li et al., 2020). The downloaded parameters are also typically analysed by a multidisciplinary team. If team members from different professional backgrounds disagree or misunderstand underlying principles, then conclusions may be drawn based on subjective information (ICAO, 2011).

1.2 Interpretative Deviations from Professional and Cultural Differences

Although in many cases interpretive biases can be resolved by ensuring all team members are satisfied with the output and any assumptions are well validated by all involved parties, there are situations where this level of collaboration is not possible. Geopolitical issues, remote locations, or more recently quarantine challenges may hinder the ability for investigators to reach accident sites before the physical evidence is irreversibly altered by search and rescue operations, secondary fires, local weather conditions, or other human factors (Nixon and Braithwaite, 2018; Wang, 2022). In situations where the wreckage is inaccessible or has been tampered with, the only available resource may be secondary data (Gisolf, Geradts and Worring, 2019; Zeiger, 2022). As local citizens and press typically have immediate access to an unadulterated crash site, visual media scoured from public websites and social media can be verified using forensic techniques to provide supportive material (McMahon, 2021). For example, in the Ukraine International Airlines PS752 crash, the wreckage was bulldozed within two days of the accident (see Figure 2). U.S. investigators had no choice but to utilise publicly available press and social media content taken during the initial hours of the crash to determine the original location, orientation, and state of wreckage components (Government of Canada, 2021; Zeiger, 2022). However, when collection and interpretation of information are conducted by different parties, the assumptions of the person capturing the image may be mismatched to the interpretation of the person viewing it (Verolme and Mieremet, 2017). Gaps in understanding between the amateurs taking the photos and professional investigators interpreting the images can lead to perceptual deviations. With investigators coming from a wide range of professional backgrounds, the extent of these deviations can vary widely, making it difficult to come up with truly objective interpretations of multimedia information.

Figure 2. Image from local media showing the bulldozing of aircraft fragments within hours of the Ukraine International Airlines PS752 accident in Tehran, Iran (Mehr News Agency, 2020).

As secondary source media are most commonly used in situations where geopolitics plays a role, the effects of national cultural differences on data collection and interpretation shall also be considered. In a previous ISASI technical paper comparing the analysis of secondary source information by investigators from different national cultures, it was discovered that cultural differences in power distance, dispositions towards organisational structures, and stigma against psychological matters created differences in how causal factors were interpreted (Li et al., 2007). Another example is of visual attention. In a study which required Japanese and U.S. participants to spot-the-difference between two airport scene vignettes (see Fig. 3), Japanese participants detected more changes in background information whereas Americans concentrated on focal objects (Masuda and Nisbett, 2006). These cultural tendencies to direct attention to different parts of visual scenes can affect how information is collected and interpreted in practice. For example, in polarimetric false-colour imagery, some objects such as charred aircraft parts stand out clearly from the background whilst other objects may appear less conspicuously (Privett et al., 2012). Investigators who are culturally inclined to focus on central objects may miss the less conspicuous background details. Cultural differences can also influence the interpretation of audio recordings. The investigation of EgyptAir Flight 990 was a notable example as U.S. and Egyptian representatives disagreed on the interpretation of the CVR recording, disputing whether the First Officer's prayer to God represented pilot suicide (ECAA, 2001).

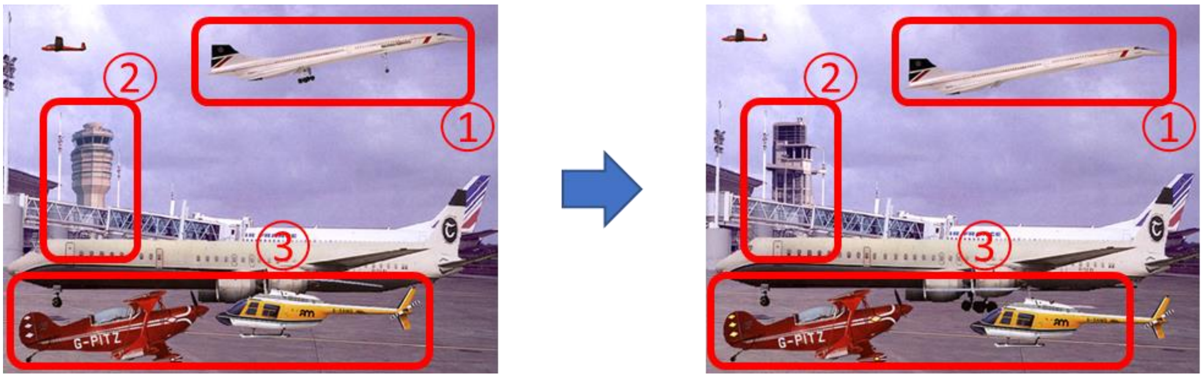


Figure 3. An example of airport scene 'spot-the-difference' vignettes used in visual attention research (Masuda and Nisbett, 2006). American participants were more likely to detect changes in focal objects such as the Concorde landing gear (box 1), whereas Japanese participants were more likely to identify background and relational changes. These were respectively represented by changes in the control tower design (box 2) and the distance between the two aircraft in the foreground (box 3).

1.3 Motivation for the Current Study

In spite of cultural differences, the expertise of a human investigator is still the most valuable resource as technological solutions are not yet mature (Wang, 2022). In image analysis activities such as wreckage search, computers may miss small objects because of something as simple as choosing the wrong resolution, but experienced human investigators can simply zoom in for a closer look (Hawkins, 2016). Whilst national cultural differences on data collection and interpretation have been well examined, recent academic research have confirmed that national differences in the aviation domain can be overpowered by exposure to professional training and work environments (Chan and Li, 2020). As accident investigators typically come from a plethora of professional backgrounds, the current challenge therefore was to find out if differences in professional backgrounds can affect data collection and interpretation. The goal of this study was to evaluate accident investigators' visual attention, data collection, and change prediction characteristics, and to determine if differences existed across professional groups.

2. Method

2.1 Material

An online survey was used for data collection. The survey contained demographic questions which enabled the categorisation of respondents based on their initial professional backgrounds (frontline crew vs. human factors specialists). This was followed by a series of items which assessed participants on their directed visual attention, data collection, and change prediction characteristics.

2.2. Perception & Directed Visual Attention Exercise

To evaluate perception and directed visual attention, participants were presented with a video of Masuda & Nisbett's airport scene vignettes (see Fig. 3). The 40-second video contained two slightly different 20-second animated clips, played one after the other (Masuda and Nisbett, 2006). The participants were asked to watch the entire video and to detect the differences between the first and second animated clips. When the video has finished playing, the participants were asked an open-ended question of what differences they had identified. There were three differences between the two clips which respectively represented changes in focal objects (the Concorde landing gear; see Fig. 4a), background objects (the ATC tower; Fig. 4b), and relational contexts (the distance between the aerobatic aircraft and the helicopter in the lower part of the image; Fig. 4c). The proposition was that the ability to spot-the-differences located at different parts of the visual scene would represent variations in perceptive sensitivity and directed visual attention.

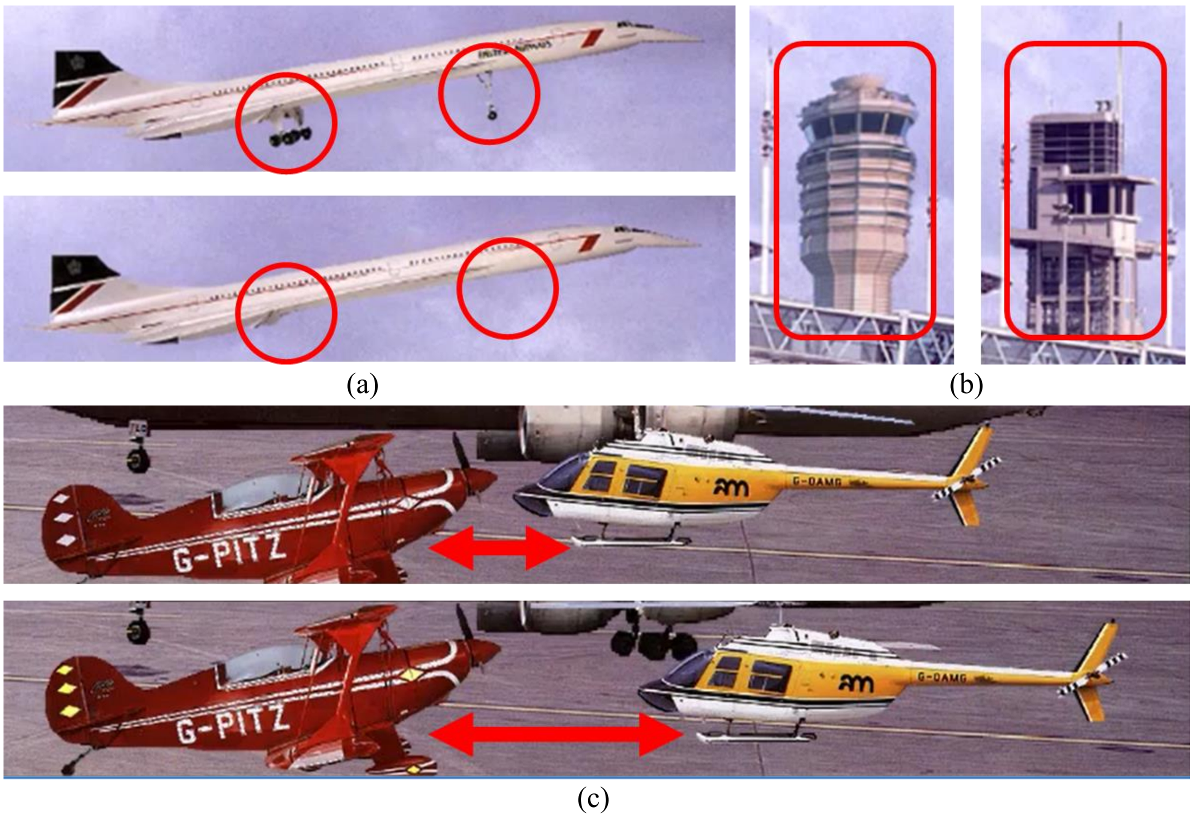


Figure 4. Differences between the first and second airport scene vignettes. (a) The Concorde landing gear represented a change in a focal object; (b) the ATC tower represented a change in a background object; and (c) the distance between the aerobatic aircraft and the helicopter represented changes in relational contexts.

2.3 Data Collection Preferences

To capture data collection preferences, the participants were tasked with an exercise to prioritise different types of multimedia information. A list consisting of ten types of photos and videos that the

ICAO recommended should be collected as part of an investigation was presented to the participants (ICAO, 2011, see Table 1). They were then asked to rank the ten types of photos and videos according to what they personally believed to be the most to least important. The hypothesis was that investigators from different professional backgrounds would differ in what type of multimedia data they considered to be important.

Table 1. "What to Photograph at the Accident Site" – Doc 9756, Section 2.2.4 (ICAO, 2011).

- Video evidence of firefighting and rescue activities
- Perishable evidence such as ground scars and skid marks
- Human remains, injuries, blood/tissue smears on wreckage
- Aerial photographs of the site
- Ground view of the wreckage
- Video evidence of the removal, transport and dismantling of wreckage components
- Evidence of fire and heat damage
- Close-ups of damaged, failed, or missing components
- Switch positions and circuit breakers
- Environmental conditions (e.g. weather, sun angle, visual illusion, lack of visual reference)

2.4 Predicting Complex Data Trends

Lastly, data interpretation characteristics in relation to the prediction of complex data trends were assessed. Four trendlines were presented to the participants one-by-one, without legends or axis markings (see Fig. 5). For subject relevance the participants were told that these trendlines were flight data readouts. They were asked to predict if the trendlines would continue to increase, level-off, or decrease in the future. The participants were also asked, using open-ended questions, to explain the rationale behind their predictions. The trendlines were designed by Ji et al. (2008), and have been validated for determining participants' sensitivity to overall, recent, and fluctuating changes within the data (Ji, Zhang and Guo, 2008).

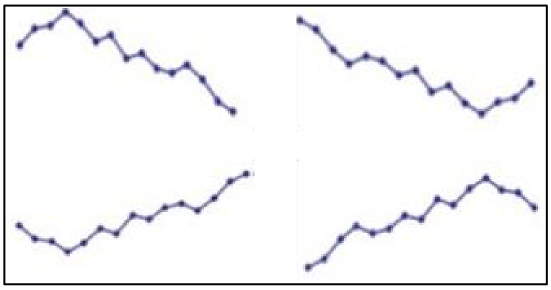


Figure 5. Trendlines provided in the survey (adapted from Ji, Zhang and Guo, 2008). Participants were asked to predict the direction of future trends and to explain the rationale behind their predictions.

2.5 Research Design

The present analysis included responses from N=18 accident investigators who were recruited by convenience sampling. Participants were sent an email which included a hyperlink to an online survey which was used for data collection over a one-week period in July 2022. Demographic items in the survey enabled the categorisation of participants and their responses into one of two groups based on their initial professional backgrounds. Eight (n=8) accident investigators were initially trained in frontline operations (air crew, engineers), and the remaining ten (n=10) participants were trained as human factors and safety management specialists. Results from the survey items which assessed directed attention, data collection, and change prediction characteristics were compared between the two groups. The survey took approximately 10-15 minutes to complete. Participation was voluntary and anonymous, with no identifying information collected. Ethics approval was provided by the Cranfield University Research Ethics System (CURES/16674/2022).

3. Results

3.1 Effects of Directed Visual Attention on Media Perception and Interpretation

Responses to the survey item evaluating perception and directed visual attention (the spot-the-difference item) were analysed by content analysis. Respondents were categorised into either frontline or human factors expert groups, and the frequency of the focal, background, and relational changes (see Fig. 4) being reported in the open-ended question item was compared between the two groups. Although we were not able to undertake advanced statistical analysis due to the small sample size, the results established that there was a likelihood that professional backgrounds can change attention allocation tendencies. A larger percentage of accident investigators with frontline backgrounds (50%) detected changes in focal object information than human factors specialists (30%). Contrarily, a larger proportion of human factors specialists (40%) detected relational changes than those initially trained in frontline positions (25%) (see Fig. 6).

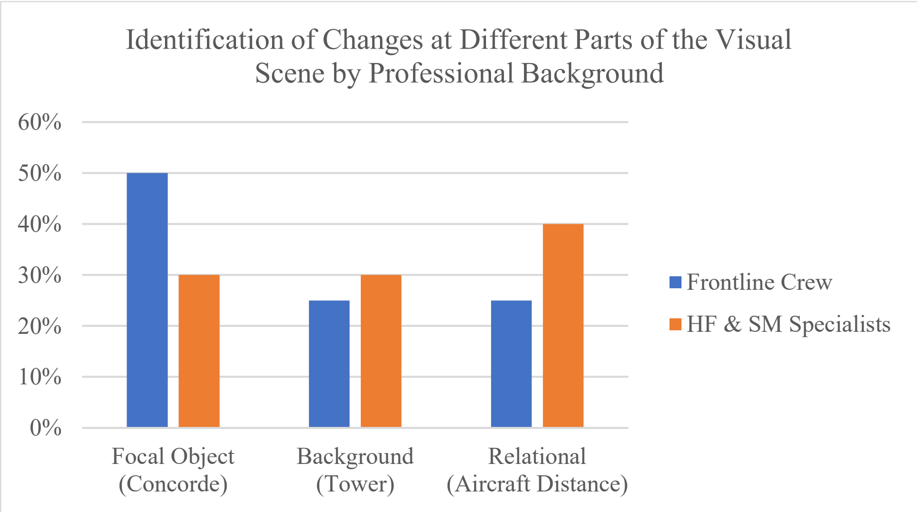


Figure 6. Identification of Changes at Different Parts of the Visual Scene by Professional Background.

Previous studies in the aviation domain have confirmed that visual attention distributions are associated with cognitive models, with eye-tracking results proving that people tend to focus more on areas that are more relevant to their tasks (Li et al., 2019). The job nature of frontline crew dictates that they work on focal objects (e.g. the aircraft itself) whereas human factors specialists are trained to consider a wider range of interrelated variables. Thus, the present results of differences in directed attention were possibly a consequence of varying work requirements and professional socialisation between the two groups.

3.2 Professional Differences in Data Collection Preferences

The results also suggest that differences in initial professional backgrounds among accident investigators could lead to differences in the type of data that is collected. In the survey item where participants were tasked with prioritising different types of photos and videos from an ICAO list (see Table 1), a larger proportion of investigators from frontline backgrounds prioritised media types which were more focused on the main wreckage (ground view; aerial photographs), whereas investigators who were professionally trained as human factors specialists prioritised the collection of contextual and perishable evidence (video evidence of component removal; ground scars and skid marks). For the present analysis, the focus was on the participants' first choice. The percentage of respondents from each professional group (frontline vs. human factors specialists) choosing each type of photo/video in the ICAO list as their first priority is presented in Fig. 7. As a small-scale study the present results complemented the findings related to the perception and directed visual attention (spot-the-difference) items above. Accident investigators initially trained in frontline operations had a greater tendency to allocate their attention to focal information, whereas their colleagues trained as human factors specialists considered contextual, background information to be more important.

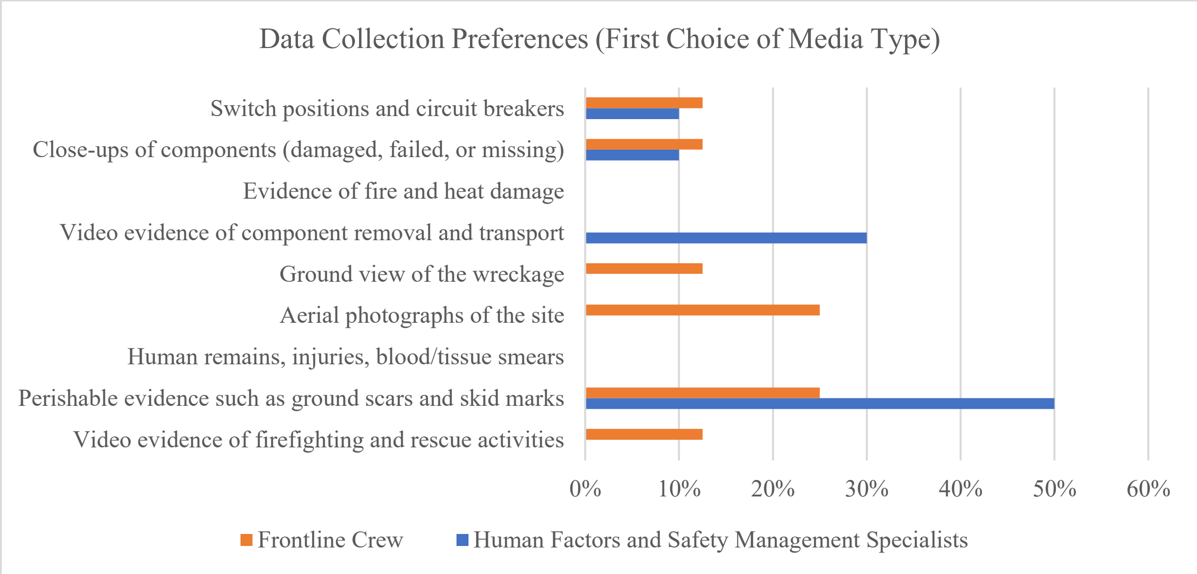


Figure 7. The First Choice of Photo/Video Media Type by Initial Professional Background.

3.3 Prediction of Future Change Dependent on Previous Trend Patterns

Results from survey items evaluating the prediction of future trends revealed that professional differences in change prediction were dependent on previous trendline movement patterns. As presented in Fig. 8, for trendlines with early reversals (trends 1 and 2) the simple majority of respondents, regardless of professional background, made predictions based on the overall trend. This would suggest that reversals early in the trendline had limited impact on future trend predictions. On the other hand, results for trends 3 and 4 (the late reversal scenarios) had greater differences between the two professional groups. Human factors specialists generally believed that a late reversal would continue: the simple majority predicted that a late rebound from the bottom (trend 3: DLR) would continue to increase, and a late drop-out (trend 4: ILR) would continue to decrease. Contrarily, most investigators who were initially trained in frontline operations tended to predict a continual decrease regardless of the reversal direction. For the frontline group, the simple majority considered a late rebound (trend 3: DLR) to be temporary, and a late drop-out (trend 4: ILR) to be longer-term.

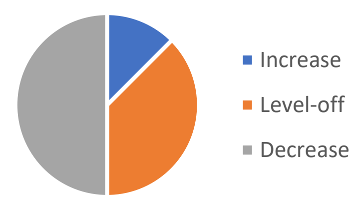
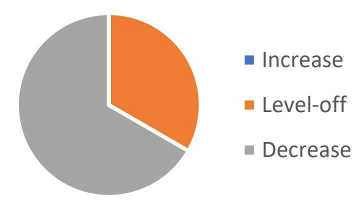
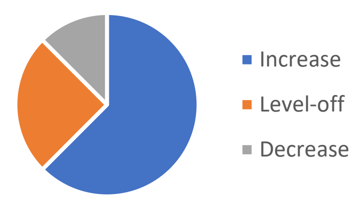
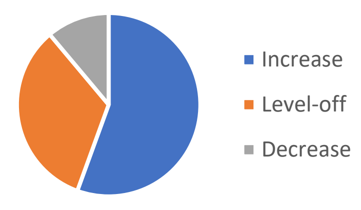
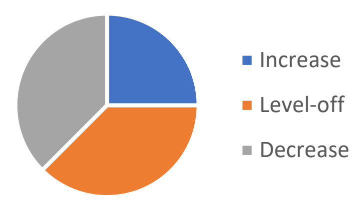
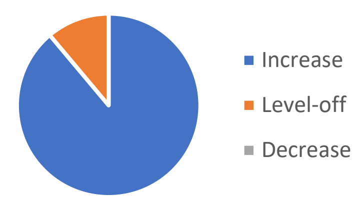
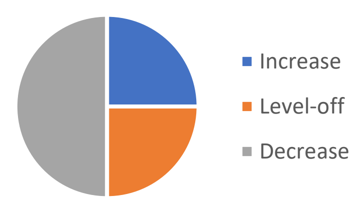
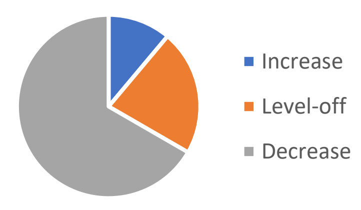
Trendline			Frontline Crew Predictions	HF Specialists' Predictions
1	Decreasing overall, early reversal (DER)			
2	Increasing overall, early reversal (IER)			
3	Decreasing overall, late reversal (DLR)			
4	Increasing overall, late reversal (ILR)			

Figure 8. Predictions for the Continuation of the Data Trendline by Initial Professional Background.

Answers to the open-ended questions in which the participants explained the rationale behind their predictions were processed by thematic analysis. The researchers identified five main themes affecting the respondents' predictions of future trends. These themes and some examples are presented in Table 2. Content analysis was then performed to establish the quantitative frequency in which these themes were mentioned by participants from different professional backgrounds (frontline vs. human factors specialists) (see Table 1). It was found that accident investigators initially trained in frontline operations considered the overall trend to a greater extent than their human factors specialist counterparts. Frontliners were also more likely to consider the outer limits (or the "envelope") of the chart, as close to one-third of their predictions were made on the premise that "trends cannot increase/decrease indefinitely". At the same time, the human factors specialists made a slightly higher proportion of their predictions based on recent (post-reversal) trends than on the overall trend.

Table 2. Thematic analysis of the rationale behind participants' predictions of future trends.

Theme	Example (respondent ID)	% Frontline Crew	% HF Specialists
Based on the overall trend	"Overall trend downwards" (R4)	52%	28%
Based on the recent trend (the reversal)	"Looking at the last four data points" (R9)	10%	32%
Cannot increase/decrease indefinitely	"Any trend cannot continue forever" (R12); "Because it cannot go much lower" (R10)	29%	8%
Slight fluctuation or rate (gradient) change suggests impending reversal	"The rate of decrease is slowing down, and therefore I think it could be assumed that a levelling off could follow" (R12)	0%	12%
Pattern matching with mental models or schemata	"The trend seems like the aircraft is during landing phase, and will flare out for touch down" (R2); "The prior levelling off portion was followed by a decrease, so there could be potential to follow here" (R12)	10%	2%

4. Discussion

4.1 Understanding the Existence of Differences in the Investigation Process

The findings of this study can be beneficial throughout the data collection, data analysis, and presentation phases of the investigation process (ICAO, 2011). The finding of perceptual differences between professional groups adds an extra dimension of culture to consider. Whilst national cultural differences were already known to affect the interpretation of human factors issues in aircraft incidents and accidents (Li et al., 2007), the present results confirmed that professional background can be considered as an additional dimension influencing perception and visual attention characteristics. This is congruent with previous research which found professional experience to override certain nationally-influenced traits (Chan and Li, 2020), and provides support for further examination of other cross-profession differences. In addition, it was known from previous studies that mismatched interpretations can be created if there are gaps in understanding between the person capturing the image and the person trying to make sense of it (Verolme and Mieremet, 2017). The present finding of differences in perception between focal, background, and relational parts of visual scenes suggests that the size of these "gaps in understanding" can be dependent on both the format of media content as well as differences in professional backgrounds. Given the same content, investigators initially trained in certain professions may have wider gaps than others. Whether these gaps perpetuate to interpretive differences may depend on whether the file contains diverse (focal, background, relational) visual scenes. Future investigators should gain an awareness of these interpersonal and intergroup differences in visual attention in order to minimise subjective biases in the interpretation of visual media. This is especially important when analysing secondary data where the interpretive contexts cannot be clarified with the person capturing the image.

It was also discovered that accident investigators from different professional backgrounds varied in their data collection preferences and priorities. The finding that investigators with frontline backgrounds prioritised photographing focal objects corresponded with previous research, as it was known that people had a tendency to focus on areas that are more relevant to them (Li et al., 2019). Similarly, the finding that human factors specialists prioritised the collection of contextual information was supported by previous findings which stated that people who were accustomed to holistic attention patterns were more likely to have a preference for context inclusiveness (Masuda et al., 2008). The results also confirmed that the relevance paradox, where people tend to only acquire information that they consider to be relevant, can be detected in accident investigation activities (Williams, 2010). For future data collection, investigators should consider their own perceptive biases to ensure that the selection of what data to collect will be based on objective considerations, rather than subjective desires.

For the change prediction items, the finding that early trendline reversals had limited impact on future trend predictions for both professional groups was consistent with previous research. Schacter et al. (1987) found early reversals at the beginning of trends to have no effect on predictions of future movements. The more interesting finding, however, was that predictions of future movements after a late reversal pattern differed between investigators from the two professional background groups. In a previous ISASI paper written by one of the current authors (Li et al., 2007), differences across national cultures were found to affect the interpretation of factors both in the lead up to an accident as well as the subsequent actions. It was argued that, as the information given to the investigators in the previous study was identical across cultural groups, the results demonstrated that there is sometimes "no such thing as an objective truth". The present finding of differences in predictions for late reversal trend patterns between investigators of different professional backgrounds suggests that cross-profession differences can be just as much of a barrier to achieving the "objective truth".

4.2 Future Solutions on Mitigating Deviations in Accident Investigation

Building greater awareness of cross-cultural and cross-profession differences in data collection and interpretation will help to improve the objectiveness of accident investigations. In the short-term, this can be implemented in the form of updates to both initial and recurrent accident investigator training courses. These updates can possibly be developed according to the *salience, effort, expectancy,* and *value* model of visual scanning which proposed that the four factors concurrently drives the direction of attention (Wickens et al., 2001). Training programs and guidance materials taking into account these four factors of *salience, effort, expectancy,* and *value* can ensure that a more appropriate array of data is collected and perceived. For example, the focus of attention can be modified by changing the *value* of a data resource. Something as simple as a facilitated discussion on the importance of different types of photographs, perhaps substantiated by the current findings and presented at some stage in the accident investigator training course, can possibly change data collection priorities (Wickens et al., 2004). Another solution which can be implemented in the short-term is by the provision of specified on-the-job coaching and/or standardised procedures. Accident investigators exploring a visual scene or interpreting a dataset can be prompted by an expert trainer or be directed by clear standardised procedures to explore a wider or more holistic scan pattern. In this way, perception and visual attention patterns can be changed by managing the *expectancy* of information in different parts of visual scenes or at different parts of trendlines. This can help to ensure that information, even if not *salient*, will be perceived by the investigator. In a study on exploratory-based training where trainees had to learn how to navigate through wide digital scenes, the provision of coaching and procedural guidance were both found to be effective in improving task performance (Plott et al., 2014). An added benefit of these kinds of directed attention training is that they can also provide the experience and practice from which accident investigators can develop more relevant and strategic attention control (Wickens et al., 2004).

Longer-term solutions may be to develop new, assistive technologies. Artificial intelligence can be used to "translate" data to different presentation styles to suit investigators from different backgrounds. For example, technological assistance in visual target selection and image categorisation can help to mitigate differences in perception and directed visual attention. Similarly, professional differences in trend prediction can be considered so that flight recorder and other trendline readouts can be presented to the investigator in a format which reduces the likelihood of predictions being unduly affected by trend reversals, perceived chart limits, or pattern matching with inappropriate schemata. Three-dimension reconstructions of accident scenes have also been proposed in recent ISASI seminars. Using photogrammetry techniques, accident scenes can be remotely scanned and recreated in virtual or augmented reality (Hawkins, 2016; Wang, 2022). This is promising technology which can possibly completely negate for differences in data collection and interpretation. There will be no need for investigators to prioritise what data to collect as the entire site can be scanned. Differences in perception and directed visual attention will be a non-issue as the accident scene can be virtually revisited and explored with infinite perspectives, angles, and resolutions.

However, a current hurdle to developing assistive technologies for accident investigation is that because no two accidents are the same, there is no baseline information on which digital models can be built. For example, the lack of consistent visual data of wreckage fields makes it difficult to develop artificial intelligence and technological systems to assist in visual target selection and image categorisation (Gisolf, Geradts and Worring, 2019). Although the calibration of visual media for technological applications is beyond the realm of the present research, results from this study provides a viable alternative by enabling the calibration of data collection and interpretation activities by encouraging more holistic points-of-view. To illustrate, consider the finding from a previous study where accident investigators were specifically given the task of identifying equipment failures but they instead listed personnel-related issues (Underwood, Waterson and Braithwaite, 2016). Whilst it is easy to simply blame the investigators for straying off-topic, the present results can add an additional perspective – it is conceivable that because the investigators thought that personnel-related issues were more relevant, they assigned higher priority to collect those data points. An awareness of the reasons behind differences in data collection and interpretation has the potential to enhance collaborative efforts and minimise conflicts in large investigation teams. Representatives can share the same understanding for why certain types of information are collected, and this can possibly result in a higher level of agreement for how information is interpreted in practice.

4.3 Limitations and Challenges

There are several limitations to this research which should be addressed. Firstly, due to time constraints, the researchers were unable to achieve a larger sample size which would have supported more advanced statistical comparisons. The current findings were thus limited to a general discussion nature. Secondly, the grouping of accident investigators into two groups may also be limiting. To illustrate, the frontline group included air crew as well as a range of engineering professionals, which could potentially be categorised into additional, more refined groups. Efforts to increase the sample size will hopefully solve both of these problems in the future. Challenges are also expected when the solutions proposed in this paper are put into practice. When Crew Resource Management training that was developed in the West were sent to Asian airlines in the 1980's and 90's, some of the concepts, such as assertion in the cockpit, were met with bewilderment (Helmreich and Merritt, 1998). As our findings on professional background differences were closely related to national culture differences, it is possible that attempts to mitigate for professional differences may be met by the same dismissive attitudes. For example, when discussing the characteristics of investigators from different professional backgrounds, it is possible for these comparisons to be considered offensive or incomprehensible. This suggests that considerations of how the current topics can be applied in practical, industrial settings may necessitate additional research and development.

5. Conclusion

The use of flight data and multimedia resources for accident investigation has been considered routine, and there is extensive guidance on how these resources can be objectively gathered and analysed. Yet, there is little consideration of how human factors can influence data collection and interpretation processes which may introduce undesirable subjective variables into official investigations. Whilst cross-cultural differences among people from different national backgrounds have been widely known to affect visual attention, attention distributions, and change prediction, little is known about how differences in professional background can affect the collection and interpretation of accident data. An understanding of professional differences is particularly important as accident investigators can come from a variety of occupational backgrounds, and because professional exposure has been proven to overpower certain nationality-associated traits in the aviation domain. In this study, a series of tests were conducted to evaluate accident investigators' directed visual attention, data collection, and change prediction tendencies. The results between investigators who were initially trained in frontline operations (air crew, engineers) were compared with results from other investigators who were trained as human factors and safety management specialists. It was discovered that the two groups varied in their detection of differences in the visual field, had different preferences in relation to the collection of multimedia data resources, and even when provided with identical information their predictions of future trends differed. The findings highlight the importance of an awareness of interpretive biases, and of the need for accident investigators to develop cultural intelligence when working with cross-profession and multi-national teams. If investigators could identify differences in how data is collected and interpreted between team members of different professional and cultural backgrounds, then the objectiveness of investigations will be improved and disagreements among diverse investigative teams can be minimised. Relevance to future developments in assistive technologies were also identified as a possible benefit, as an awareness of interpretive differences can be useful for the development of tools to correct for cultural and professional variations.

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